REMARKS

Claims 13, 15, 17, 19-21, 23, 26, 29-32, and 34-36 are all claims presently pending in the application. Applicant has canceled Claims 24 and 25 as well as Claim 33 without prejudice or disclaimer. Claim 33 was previously withdrawn by the Office Action of March 28, 2003. Applicant gratefully acknowledges the Examiner's allowance of claims 13, 15, 17, 19-21, 23, 31, 32 and 34-36. By this Amendment, reconsideration is respectfully requested.

Claims 24-25 are objected under 37 C.F.R. Part 1.75(c) but, as indicated, Applicant has canceled these claims without prejudice or disclaimer. Claims 26 and 29-30 stand rejected on prior art grounds under 35 U.S.C. § 103(a) as being unpatentable over Loutfy, et al.

These rejections are respectfully traversed in view of the following discussion.

Entry of this 1.116 Amendment is proper. Since the amendments above narrow the issues for appeal and since such features were in the claims earlier, such amendments do not raise a new issue requiring further searching and/or consideration by the Examiner. As such, entry of this Amendment is believed to be proper and is earnestly solicited.

It is noted that the amendments are made only to more particularly define the invention and not for distinguishing the invention over the prior art, for narrowing the scope of the claims, or for any reason related to a statutory requirement for patentability.

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and claimed, for example by independent claim 26, is directed to a laser irradiation target for the manufacture of carbon nanotubes by laser ablation.

The target includes a fullerene powder and a catalyst powder pressed together with the fullerene powder to form a pellet. The laser irradiation target forms a carbon nanotube when subjected to laser ablation. Importantly, the catalyst powder comprises Co in a predetermined range of at %. (See Page 5, lines 3-7; Page 8, line 27-Page 9, line 5 and lines 27-30; Page 11, lines 23-27; and Page 13, lines 1-5 and 19-20).

Conventional targets are graphite carbon based materials suitable for producing multi-wall carbon nanotube structures at generally high temperatures. However, such conventional targets can only be used at high temperatures and with complex equipment. (See Application, Page 1, line 25-Page 2, line 3; Page 2, lines 20-22 and 26-29; and Page 3, lines 11-30).

An aspect of this inventive combination is that the catalyst powder comprises Co in a predetermined range of at %. This aspect permits a carbon nanotube to be produced at low process temperature using a short pulse-width laser ablation method. (See Page 1, lines 2-7; Page 4, lines 7-10; Page 5, lines 3-7 and 10-15; Page 8, line 27-Page 9, lines 5, 10-16 and 27-30; Page 11, lines 23-27; and Page 13, lines 1-5 and 19-20).

As a result of this inventive structure, the low process temperatures permit the use of simple production equipment while reducing manufacturing cost and maximizing the yield of the nanotubes thus increasing the quality of electronic circuit chips. (See Page 4, lines 7-10; Page 7, lines 26-28; Page 9, lines 10-16).

II. THE PRIOR ART REJECTIONS

A. The § 103(a) Rejection under Loufty, et al.

Loufty, et al. ("Loufty") fails to disclose, teach or suggest the features of independent claim 26, including the catalyst powder comprises Co in a predetermined range of at %. (See Page 5, lines 3-7; Page 8, line 27-Page 9, line 5 and lines 27-30; Page 11, lines 23-27; and Page 13, lines 1-5 and 19-20).

As previously noted, in Applicant's invention (e.g., as defined in Claim 32), the inventive laser irradiation target includes a fullerene powder pressed together with a catalyst powder. The catalyst powder may be formed from Co present in a predetermined range of atomic percent, for example, where the at % is in a range of 4.5 at % and 5.5 at % and is used to control the "efficient formation of the single-wall carbon nanotubes." Accordingly, as indicated above, the carbon nanotubes are produced at a low process temperature using a short pulse-width of the laser. (See Page 1, lines 2-7; Page 4, lines 7-10; Page 5, lines 10-15; and Page 9, lines 10-16; and Page 13, lines 1-5 and 16-20).

Applicant agrees with the Examiner that "[t]he reference does not exemplify the claimed features" but traverses the assertion in the Office Action that these features are suggested among a host of choices as obvious selection of materials. (See Office Action, Page 2).

Instead, Loufty only teaches an electrochemical cell in a container 101, including a proton donor electrolyte 102 in contact with "first and second electrodes [103, 104] one of which consists essentially of a fullerene in contact with a conductive material." This structure "stor[es] hydrogen and electrical energy through hydrogenation of the new form of carbon referred to as fullerene or Buckminsterfullerene." (See Loufty at Abstract; Column 1, lines 5-

10; Column 2, lines 5-20; and Column 3, line 60-Column 4, line 10).

Accordingly, Loufty aims to improve the characteristics of a battery by giving an electrode higher conductivity. In contrast, the present invention aims to provide a laser target for constructing a nanotube. Therefore, Loufty cannot achieve the effects that the present invention brings about.

Further, in the present invention, C_{60} lets the process temperature go down, and Ni and Co are added as catalysts to enhance the reaction efficiency. Loufty does not teach or suggest this feature. Thus, those skilled in the art cannot think of this feature of the present invention.

Significantly, the content of Ni and Co is also different. In the present invention these catalytic elements may be found at approximately 5 at% whereas, although used for a different purpose though not as a catalyst, Loufty teaches that the elements may be found at 30-80 at%. Therefore, Loufty can not obtain the same effect as the present invention.

In particular, in Loufty, the conductive material may be carbon or silver in a range of 10-50 volume percent where the fullerene is embedded in a conductive matrix containing the conductive material. As indicated, fullerenes "are not good conductors, an electrode made from fullerenes must be made to conduct charge by adding a conductive material to the fullerenes material to ensure that electrons are easily added to the fullerene molecules." Contrary to the assertion in the Office Action, the conductive material appears to provide electrons not function as a catalyst powder to facilitate a reaction like Applicant's invention as suggested in the Office Action. (See Office Action, Page 2).

Please note, contrary to the Office Action, Loufty teaches replacement of the conventional nickel-cadmium electrode, including Ni, with a C_n-H_x electrode as part of the invention not use of nickel as part of the positive or negative electrode. (See Office Action,

Page 2; Column 3, lines 60-67; Column 4, line 64-Column 6, line 22; and Column 7, lines 1-20 and 60-65). Thus, Loufty does not disclose, teach or suggest, including a catalyst or catalyst powder, let alone, a catalyst powder, which comprises Co in a predetermined range of atomic percentage.

Indeed, Loufty is focused on teaching an improved fuel cell or battery with improved conductivity by involving an electrochemical fullerene system using a hydrogenated fullerene compound mixed with a conductive material, such as, silver or carbon, as an electrode to store hydrogen and electrical energy in a stainless steel container. Accordingly, the conductive material attempts to improve conductivity by providing electrons not function as a catalyst to facilitate a reaction. One of ordinary skill in the art would clearly define such a material, which provides electrons, as a conductive material not as a catalyst, which alters a reaction rate and may be recovered essentially unaltered after the reaction without itself being consumed. (See Loufty at Abstract; Column 1, lines 5-10; and Column 2, lines 5-50; and McGraw-Hill Dictionary of Scientific and Technical Terms, 1989, 4th Edition).

For emphasis, Applicant's invention teaches a fullerene powder and a catalyst powder, which are "pressed together" in a laser ablation apparatus to form single wall carbon nanotubes unrelated to an electrochemical cell. The catalyst powder, which may be comprised of cobalt not silver or carbon, functions to facilitate a reaction in forming a carbon nanotube structure not improve conductivity as taught by Loufty. Therefore, Applicant's invention is not disclosed, taught or suggested by Loufty.

Consequently, the Loufty invention, and related structure, is unsuitable for producing a carbon nanotube at low process temperatures using a short pulse-width laser ablation method. Thus, Applicant's target, including the specific catalyst powder, produces an

"unexpected result" when combined with the low process temperatures, which permits the use of simple production equipment while reducing manufacturing cost and maximizing the yield of the carbon nanotubes, and thus increases the quality of the electronic circuit chips. (See Page 1, lines 2-7; Page 4, lines 7-10; Page 5, lines 10-15; Page 7, lines 26-28; and Page 9, lines 10-16). Therefore, Applicant traverses this rejection. (See Office Action, Page 2).

For at least the reasons outlined above, Applicant respectfully submits that Loufty does not disclose, teach or suggest all the features of independent claim 26, and related dependent claims 29 and 30, which are patentable not only by virtue of their dependency from the respective independent claim, but also by the additional limitations they recite. Thus, Loufty does not anticipate or render obvious the subject matter of claim 26.

For the reasons stated above, the claimed invention is fully patentable over the cited reference.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 13, 15, 17, 19-21, 23, 26, 29-32, and 34-36, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 11/26/03

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that I am filing this Amendment by facsimile with the United States Patent and Trademark Office to Examiner Stuart L. Hendrickson, Group Art Unit 1754 at fax number (703) 872-9311 this 26th day of November, 2003.

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